

REMARKS

Claims 1-13 are pending in this application. By this Amendment, claims 1, 2, 4 and 10 have been amended. Reconsideration in view of the above amendments and following remarks is respectfully requested.

The Office Action objects to claim 2 because of informalities. Applicants assert that the above-described amendment to claim 2 obviates the grounds for the objection. Accordingly, Applicants respectfully request that the objection to claim 2 be withdrawn.

The Office Action rejects claims 4-9 and 12 under 35 U.S.C. §102(b) over Kyushima et al. (U.S. Patent No. 5,504,386) (Kyushima). Applicants respectfully traverse this rejection.

In particular, Applicants assert that Kyushima does not disclose or suggest a photomultiplier tube comprising *inter alia* a metal side tube, the entirety of an outer surface of the metal side tube being substantially in parallel with an axial direction of the metal side tube, an outer surface of the metal side tube is flush with an edge surface of the stem plate, as recited in independent claim 4.

As noted previously, Kyushima corresponds to Japanese Unexamined Patent Application No. HEI-5-290793, which is discussed in the Background Art section of Applicants' specification. As recognized by the Patent Office, Kyushima teaches a generally cylindrical side wall and an outwardly protruding, flange-shaped, annular sealing area (col. 3, lines 57-61, Fig. 2(b)) ("flange"). The Patent Office now considers this flange to be part of a "metal side tube."

However, the outer surface of the flange (or at least part thereof) is perpendicular to an axial direction of the metal side tube represented, for instance, by the direction of the stem leads 6. In other words, the entire outer surface of the flange in Kyushima is not substantially in parallel with an axial direction of the metal side tube. Accordingly, Applicants assert that, even if Kyushima's flange is considered to be part of a metal side tube, Kyushima does not

disclose each and every feature of independent claim 4 and its dependent claims. As such, Applicants respectfully request that the rejection of claims 4-9 and 12 over Kyushima be withdrawn.

The Office Action rejects claims 1-3, 7 and 11 under 35 U.S.C. §103(a) over Kyushima in view of Frederick et al. (U.S. Patent No. 5,796,109) (Frederick), claims 4, 6, 8 and 12 under 35 U.S.C. §103(a) over Sawai et al. (U.S. Patent No. 5,594,301) (Sawai) in view of Kyushima and claims 10 and 13 under 35 U.S.C. §103(a) over Wang et al. (U.S. Patent No. 4,221,967) (Wang) in view of Kyushima. Applicants respectfully traverse these rejections.

In particular, Applicants assert that Kyushima and Frederick, either alone or in combination, do not disclose, suggest or render obvious a method of manufacturing a photomultiplier tube comprising the steps of *inter alia* aligning a metal side tube with the stem plate so that an outer surface of the metal side tube is flush with an edge surface of the stem plate wherein the entirety of the outer surface of the metal side tube is substantially in parallel with an axial direction of the metal side tube when aligned, as recited in independent claim 1.

The Office Action (page 7, line 22 - page 8, line 1) admits that Kyushima fails to teach the use of laser welding or electron beam welding, and relies on Frederick for this teaching. Although Frederick discloses electron beam welding as one of several possible types of welding, including resistance welding, Frederick does not disclose any advantages of electronic beam welding over resistance welding, and also does not disclose welding in the context of connecting a metal side tube to a stem plate. Hence, there would have been no motivation to combine the references. Additionally, even if combined, there is no evidence that the resulting structure would not have the outwardly protruding flanges of Kyushima which are not parallel to an axis of the metal side tube, as discussed above. Accordingly,

Applicants respectfully request that the rejection of claims 1-3, 7 and 11 over Kyushima and Frederick be withdrawn.

Moreover, Applicants assert that Sawai and Kyushima, either alone or in combination, fail to disclose, suggest or render obvious a photomultiplier tube comprising *inter alia* a metal side tube with the stem plate fixed on one open end, and enclosing the electron multiplying section and the anode, the entirety of an outer surface of the metal side tube being substantially in parallel with an axial direction of the metal side tube, as recited in independent claim 4.

The Office Action admits that Sawai fails to teach that the stem plate is welded on the one open end of the metal side tube (Office Action, page 9, lines 19-20), but relies on Kyushima for such a teaching. However, the welding disclosed by Kyushima requires flanges that protrude outwardly and substantially perpendicularly to the axis of the metal side tube. Accordingly, if modified per Kyushima, the Sawai apparatus would also have flanges, and thus would lack the "entirety of an outer surface of the metal side tube being substantially in parallel with an axial direction of the metal side tube" feature of claim 4 since Kyushima must be considered in its entirety. As such, Applicants assert that the combination of Sawai and Kyushima does not disclose, suggest or render obvious the features of claim 4 and its dependent claims. Accordingly, Applicants respectfully request that the rejection of claims 4, 6, 8 and 12 over Sawai and Kyushima be withdrawn.

Also, Applicants assert that neither Wang nor Kyushima, either alone or in combination, disclose, suggest or render obvious a radiation detector comprising *inter alia* a metal side tube with a metal stem plate fixed on one open end, and enclosing the electron multiplying section and the anode, the entirety of an outer surface of the metal side tube being substantially in parallel with an axial direction of the metal side tube, as recited in independent claim 10.

The Office Action admits that Wang fails to disclose or suggest various features of claim 10 including a side tube welded to a stem plate, as recited in claim 10 (Office Action, page 11, lines 6-20), and relies on Kyushima to overcome this deficiency. However, even if these references were combined, since Kyushima discloses welding that requires outwardly protruding flanges substantially perpendicular to an axial direction of the metal side tube as disclosed above, Applicants assert that the combination of Wang and Kyushima fails to disclose or render obvious each and every feature of independent claim 10 and its dependent claim. As such, Applicants respectfully request that the rejection of claims 10 and 13 over Wang and Kyushima be withdrawn.

Finally, Applicants note that Kyushima, which is disclosed in Applicants' "Background Art" section of the specification, discloses a photomultiplier tube in which the flange portions required for resistance welding interfere with the use of the tube (Specification, page 3, line 24 - page 4, line 7). Applicants further discuss in the specification that Kyushima's photomultiplier tubes present a configuration in which the flange portions contact other flange portions, therefore forming dead spaces. The photomultiplier tubes as taught by Kyushima use a vessel made of glass that has a flange in the lowermost portion of the vessel for bonding the vessel to the stem plate. Dead spaces are a hindrance to achieving a high performance detecting device because the tubes are not arranged closely together to form a large area for receiving light. Accordingly, when a plurality of photomultiplier tubes are arranged to make up a large photodetecting surface, the photomultiplier tubes, because of the outwardly protruding flange portions, are disadvantageous because they create a lot of dead spaces. Accordingly, the presence of an outwardly protruding flange portion in Kyushima significantly hinders the utilization of the photomultiplier tubes when they are intended to be used to receive an optimum amount of light and end up forming a large area because of the outwardly protruding flanges.

In contrast, the "flush" feature of Applicants' invention allows a tight arrangement of the tubes without any dead space between them.

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 1-13 are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,



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